63-1-1

REPORT NO. FTDM-2243
DATE: 10 Sept.1962

MATERIAL - STRUCTURAL POTTING COMPOUND: FOAMED-IN-PLACE, EPOXY - PHENOLIC RESIN TYPE - QUALIFICATION OF

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GENERAL DYNAMICS | FORT WORTH

CONVAIR
FORT WORTH

Department 6
FWP 2376 - 2 - 53

TEST DATA MEMORANDUM

FTDM NO. 2243
MODEL B-58
TEST NO. F-7729

TEST: MATERIAL - STRUCTURAL POTTING COMPOUND: FOAMED-IN-PLACE, EPOXY-PHENOLIC RESIN TYPE - QUALIFICATION OF

OBJECT: To determine if Adhesive Engineering's Thermofoam 607 meets the requirements of proposed Convair Specification FMS-0076.

TEST SPECIMENS AND PROCEDURES - Test specimens and procedures are given in Table I.

RESULTS: Results are given in Tables IV through XV and Figures 1 through 4, and summarized in Table III.

DISCUSSION: Adhesive Engineering's Thermofoam 607 foamed-in-place potting compound is presently used for structural applications in the B-58 wing leading edge and in repair of brazed stainless steel panels. The material is purchased as a commercial item as no specification exists for its control.

There are three different types of Thermofoam 607 in use at this time. The composition and proportions of these three types are given in Table II.

Information was needed to verify Convair's proposed specification FMS-0076 for foamed-in-place structural potting compound of the epoxy-phenolic resin type; hence this test was originated in order to substantiate known characteristics and properties of Thermofoam 607 (types I, IA, and II) and to establish requirements for future acceptance testing of this material.

A question was raised on the cure of the foam for compression specimens as to whether the cure as called out in the procedures was adequate; hence a few specimens were fabricated using a different cure as shown in Table I (B.IV.b). The results for this alternate cure are shown in Table XV and Figure 4. Of all the compression specimens tested, there was only one that went below the proposed minimum values. However, a rerun of this lot was satisfactory when cured as described in Table I (B.IV.b.).

It was noted that at least one sample of each type of Thermofoam did not meet the density requirement as set up in the proposed specification; hence the proposed specification may need to be changed to comply with the test results.

The cellular structure of the foam as stipulated in the proposed FMS-0076 (1/4 inch maximum, 1/16 inch average voids) was satisfactory for all the lots tested. However, some variation existed in the different lots of material which resulted in varying densities with the same types of foam. Generally as the density increased the compressive strength was also proportionally increased (see Figures 1, 2, 3, and 4).

CONCLUSION: Adhesive Engineering's Thermofoam 607 meets the requirements of the proposed Convair Specification FMS-0076 except for the density requirement as shown in Tables IV through XV and Figures 1 through 4.

Test dates: 7-21-58 to 3-27-59

WITNESS:

BY Floyd DeLeon Jr.
CHECKED J R N J. P. Thomas
APPROVED D C Torelli
H. P. Owen

DATE: 4-29-59
de

TABLE I

TEST SPECIMENS, FABRICATION, AND TESTING PROCEDURES FOR SPECIMENS OF THERMOFOAM 607, TYPES I, IA, AND II PER PROPOSED CONVAIR SPECIFICATION FMS-0076

A. TEST SPECIMENS

I. Thermofoam 607, Type I: Lot #1412 (Mfg. Date 5-5-58) Adhesive Engr. Co.
Lot #1418 (Mfg. Date 6-13-58) San Carlos, Calif.
Lot #1422 (Mfg. Date 7-7-58)
Lot #1433 (Mfg. Date 8-22-58)
Lot #1453 (Mfg. Date 10-14-58)

II. Thermofoam 607, Type IA: Lot #1412 + 2.3 Parts by wgt. Diethylenetriamine
Lot #1418 " " " "
Lot #1422 " " " "
Lot #1433 " " " "
Lot #1453 " " " "

III. Thermofoam 607, Type II: Lot #372 (Mfg. Date 1-2-58)
Lot #3453 (Mfg. Date 6-7-58)
Lot #3457 (Mfg. Date 7-8-58)
Lot #2479-A3 (Mfg. Date 9-23-58)

B. PROCEDURES

Fabrication and testing procedures for specimens of Thermofoam 607, Types I, IA, and II per proposed FMS-0076

I. Viscosity - (Types I and IA) Results Shown In Table III, IV and V.

a. Mix Thermofoam 607 (parts A and B to form Type I) (parts A, B, and C to form Type IA) thoroughly in the quart container that contained part A.

b. Determine the viscosity of the material with a Brookfield Viscosimeter.

1. Use #5 spindle with a speed of 20 RPM.

2. Keep a uniform temperature of 77 $\pm 2^{\circ}$F.

3. Rotate spindle several times before taking a reading.

4. Report viscosity in centipoises taken from the average of three readings.

II. Expansion Factor* (Types I, IA, and II) Results Shown On Tables III, VI, VII and VIII.

a. Rinse a pint tin can with acetone and place 100 grams of Thermofoam material in the can.

TABLE I (Continued)

b. Cure as follows:

1. Types I and IA -

(a) Increase the temperature from room temperature to 180° ±15°F at a maximum rate of 50°F per minute and dwell at this temperature for 30 ±5 minutes.

(b) Increase the temperature to 235 ±15°F at a maximum rate of 50°F per minute and precure for 30 ±5 minutes.

(c) Increase the temperature to 350 ±10°F at a maximum of 10°F per minute and cure for 35 ±5 minutes at this temperature.

2. Type II -

(a) Increase the temperature from room temperature to 235 ±15°F at a maximum rate of 50°F per minute and precure at this temperature for 30 ±5 minutes.

(b) Increase the temperature to 350 ±10°F at a maximum rate of 10°F per minute and cure at this temperature for 35 ±5 minutes.

c. When can and material have cooled to room temperature, determine the volume as follows:

1. Pour a measured amount of water into the can to fill it completely.

2. Subtract the cubic centimeters of water poured in from 510 c.c. (capacity of empty can) to obtain the volume of the foam in cubic centimeters.

3. Divide the cubic centimeters of foam by 16.4 to obtain the volume in cubic inches.

d. Determine expansion factor by dividing the volume (in cubic inches) by the total solids in grams to obtain the cu.in./gram.

*See footnote on Table VI for explanation of Expansion Factor.

TABLE I (Continued)

III. Percent Total Solids (Types I, IA, and II) Results Shown On Tables III, IX, X, and XI.

a. Weigh three samples (2 to 6 grams each), for each type of Thermofoam, into pre-weighed aluminum foil dishes.

b. Heat in a circulating oven for 2 hours at 350 ±10°F or until constant weights are obtained. Cool samples in a dessicator.

c. Calculate the percent total solids for each sample using the following equation:

$$\text{Percent Total Solids} = 100 \cdot \left(\frac{A - D}{B - D}\right)$$

A = Weight in grams of cured sample and dish

B = Weight in grams of original sample and dish

D = Weight in grams of aluminum foil dish

d. The percent total solids shall be reported as the average of the three values.

IV. Test Block (Types I, IA, and II) Results Shown On Tables III, XII, XIII, XIV, and XV.

a. Preparation of Test Block -

1. The test block shall be prepared using a clean pint paint can as a mold. Rinse the can with acetone and wrap with strong reinforcing tape to prevent rupture of the seams.

2. Vent the can lid with five 1/8 inch diameter holes equally spaced over the area of the lid.

3. Place 330 grams of Thermofoam Type I, 240 grams of Type IA, or 300 grams of Type II in can.

4. Lay 8 layers of Osnaburg cloth over the vented lid and clamp can tightly between 1/4 inch thick aluminum plates.

5. Cure the material following the same cure cycles as called out for expansion factor (B.II.b. in this table).

6. Allow test block to cool to 100°F or less before removal from the mold.

TABLE I (Continued)

b. Alternate Cure of Test Block

1. Place the foam in cans as per B.IV.a.3. above.

2. Use a control can with a thermocouple inserted in the center to ascertain correct foam temperature.

3. Place cans with Thermofoam in a cold oven and turn the oven on.

4. Allow the temperature to reach 180°F (approximately 36 min.) as determined by the thermocouple inside the can and dwell at 180°F for 30 min.

5. Increase the temperature to 235°F (approximately 40 min.) and dwell at this temperature for 30 minutes.

6. Following the above cure, increase the temperature to 350°F (approximately 32 min.) and dwell at this temperature for 35 minutes.

7. Remove the cans from the oven and allow them to cool to at least 100°F before removing test block from can.

c. Preparation of Test Specimens -

1. Three test specimens (2" x 1" x 1") shall be cut from the center of the test block. Dimensional tolerances shall be ±.02".

2. The two inch dimension shall be parallel to the foaming direction. All surfaces to be parallel within ±.002".

3. Cellular quality of the test specimens shall be that they contain no visible voids 1/4" in diameter or larger.

d. Density of Test Specimens - Results shown on Tables III and XII through XV.

1. Weigh each of the test specimens to the nearest 0.1 gram.

2. Measure the dimensions of each specimen to the nearest .01 inch.

3. Calculate the density of each specimen using the following equation:

TABLE I (Continued)

$$D = \frac{G}{L \cdot W \cdot H} \cdot 3.81$$

D = Density in lbs./cu.ft.
H = Height of Spec. in inches
G = Weight of Spec. in grams
L = Length of Spec. in inches
W = Width of Spec. in inches

4. The reported density shall be the average of the three specimens.

e. Compressive Strength of Test Specimens - Results Shown on Tables III and XII through XV.

1. Determine the ultimate compression load of each specimen at 260°F after the specimen has been soaked at 260° ±10°F for 30 ±5 minutes.

2. Apply the load on the 1" x 1" bearing surface using a self-aligning head and a loading rate of 1500#/min.

3. Using the ultimate load and the bearing surface area of each specimen (dimensions measured to the nearest .01"), calculate the compression strength in psi by using the following equation:

$$C = \frac{l}{W \cdot L}$$

C = Compressive Strength in psi
l = Load Failure in pounds
W = Width of Specimen in inches
L = Length of Specimen in inches

4. The average of the three specimens shall be reported as the compressive strength.

TABLE II

COMPOSITION AND PROPORTIONS OF ADHESIVE ENGINEERING'S THERMOFOAM 607, TYPES I, IA, AND II

COMPONENTS	TYPE I		TYPE IA			TYPE II
	Part A	Part B	Part A	Part B	Part C	
Plyophen 5023		66.67		66.67		66.67
Epon 1001	33.33		33.33			33.33
Aluminum Dust (85% min. through 325 Mesh Screen)	100.00		100.00			100.00
Dicyandiamide (100 Mesh)		6.00		6.00		6.00
Copper 8-Quinolinolate		1.00		1.00		1.00
Acetone	22.20		22.20			
Diethylenetriamine					2.30	

NOTE: All proportions as given in above table are parts by weight.

TABLE III

SUMMARY OF ALL RESULTS TOGETHER WITH SPECIFICATION MINIMUM REQUIREMENTS (SHOWN IN TABLES IV THROUGH XV AND FIGURES 1 THROUGH 4)

A. VISCOSITY - Specification Minimum Requirements - None Given

I. Type I - Shown in Table IV (Average of 3 Readings)

(a) Lot #1412 - 10,020 Centipoises
(b) Lot #1418 - 9,966 Centipoises
(c) Lot #1422 - 10,166 Centipoises
(d) Lot #1433 - 15,533 Centipoises
(e) Lot #1453 - 14,500 Centipoises

II. Type IA - Shown in Table V (Average of 3 Readings)

(a) Lot #1412A - 15,266 Centipoises
(b) Lot #1418A - 19,333 Centipoises
(c) Lot #1422A - 15,200 Centipoises
(d) Lot #1433A - 16,600 Centipoises
(e) Lot #1453A - 21,133 Centipoises

B. EXPANSION FACTOR* - Specification Minimum Requirements - None Given

I. Type I - Shown in Table VI

(a) Lot #1412 - .0935 cu.in./gram
(b) Lot #1418 - .0967 cu.in./gram
(c) Lot #1422 - .1065 cu.in./gram
(d) Lot #1433 - .0945 cu.in./gram
(e) Lot #1453 - .0966 cu.in./gram

II. Type IA - Shown in Table VII

(a) Lot #1412A - .2064 cu.in./gram
(b) Lot #1418A - .2302 cu.in./gram
(c) Lot #1422A - .2299 cu.in./gram
(d) Lot #1433A - .2139 cu.in./gram
(e) Lot #1453A - .2175 cu.in./gram

III. Type II - Shown in Table VIII

(a) Lot #3453 - .0957 cu.in./gram
(b) Lot #3457 - .0776 cu.in./gram
(c) Lot #372 - .0880 cu.in./gram
(d) Lot #2479-A3 - .0936 cu.in./gram

*See footnote on Table VI for explanation of Expansion Factor.

TABLE III (Continued)

C. PERCENT TOTAL SOLIDS - Specification Requirements - None Given

I. Type I - Shown in Table IX (Average of 3 Samples)

(a) Lot #1412 - 83.6%
(b) Lot #1418 - 85.2%
(c) Lot #1422 - 83.6%
(d) Lot #1433 - 83.8%
(e) Lot #1453 - 83.3%

II. Type IA - Shown in Table X (Average of 3 Samples)

(a) Lot #1412A - 86.7%
(b) Lot #1418A - 87.3%
(c) Lot #1422A - 89.6%
(d) Lot #1433A - 84.6%
(e) Lot #1453A - 84.6%

III. Type II - Shown in Table XI (Average of 3 Samples)

(a) Lot #3453 - 93.0%
(b) Lot #3457 - 93.3%
(c) Lot #372 - 93.9%
(d) Lot #2479-A3 - 93.2%

D. DENSITY - Specification Requirements Types I and II - 35 ±5#/cu.ft., Type IA - 25 ±5#/cu.ft.

I. Type I - Shown in Table XII and Figure 1 (Average of 3 Specimens)

(a) Lot #1412 - 50.49#/cu.ft.
(b) Lot #1418 - 34.40#/cu.ft.
(c) Lot #1422 - 35.55#/cu.ft.
(d) Lot #1433 - 33.84#/cu.ft.
(e) Lot #1453 - 32.07#/cu.ft.

II. Type IA - Shown in Table XIII and Figure 2 (Average of 3 Specimens)

(a) Lot #1412A - 17.04#/cu.ft.
(b) Lot #1418A - 25.03#/cu.ft.
(c) Lot #1422A - 23.77#/cu.ft.
(d) Lot #1433A - 30.62#/cu.ft.
(e) Lot #1453A - 27.89#/cu.ft.

III. Type II - Shown in Table XIV and Figure 3 (Average of 3 Specimens)

(a) Lot #3453 - 20.31#/cu.ft.
(b) Lot #3457 - 33.89#/cu.ft.
(c) Lot #372 - 29.05#/cu.ft.
(d) Lot #2479-A3 - 30.51#/cu.ft.

TABLE III (Continued)

IV. Types I, IA, and II - Shown in Table XV and Figure 4

(a) Lot #2479-A3 - Type II - 44.50#/cu.ft.
(b) Lot #1412 - Type I - 40.69#/cu.ft.
(c) Lot #1433 - Type I - 39.37#/cu.ft.
(d) Lot #1453 - Type I - 34.69#/cu.ft.
(e) Lot #1453A - Type IA - 26.28#/cu.ft.

E. COMPRESSIVE STRENGTH - Specification Requirements Shown in Figures 1 Through 4

I. Type I - Shown in Table XII and Figure 1 (Average of 3 Specimens)

(a) Lot #1412 - 2057 psi
(b) Lot #1418 - 1562 psi
(c) Lot #1422 - 1215 psi (Tested at 260°F)
(d) Lot #1433 - 583 psi
(e) Lot #1453 - 854 psi

II. Type IA - Shown in Table XIII and Figure 2 (Average of 3 Specimens)

(a) Lot #1412A - 880 psi
(b) Lot #1418A - 1097 psi
(c) Lot #1422A - 768 psi (Tested at 260°F)
(d) Lot #1433A - 1319 psi
(e) Lot #1453A - 1217 psi

III. Type II - Shown in Table XIV and Figure 3 (Average of 3 Specimens)

(a) Lot #3453 - 378 psi
(b) Lot #3457 - 848 psi
(c) Lot #372 - 937 psi (Tested at 260°F)
(d) Lot #2479-A3 - 788 psi

IV. Types I, IA, and II - Shown in Table XV and Figure 4

(a) Lot #2479-A3 - Type II - 1528 psi
(b) Lot #1412 - Type I - 2156 psi
(c) Lot #1433 - Type I - 1761 psi (Tested at 260°F).
(d) Lot #1453 - Type I - 1262 psi
(e) Lot #1453A - Type IA - 1055 psi

TABLE IV

VISCOSITY RESULTS ON THERMOFOAM TYPE I
AS TESTED PER B.I.a AND B.I.b IN TABLE I

A. Lot #1412

Readings:	1.	10,020	
	2.	10,040	Avg. 10,020 Centipoises
	3.	10,000	

B. Lot #1418

Readings:	1.	10,000	
	2.	9,000	Avg. 9,966 Centipoises
	3.	10,000	

C. Lot #1422

Readings:	1.	10,200	
	2.	10,140	Avg. 10,166 Centipoises
	3.	10,160	

D. Lot #1433

Readings:	1.	15,200	
	2.	15,600	Avg. 15,533 Centipoises
	3.	15,800	

E. Lot #1453

Readings:	1.	14,600	
	2.	14,300	Avg. 14,500 Centipoises
	3.	14,600	

TABLE V

VISCOSITY RESULTS ON THERMOFOAM TYPE IA
AS TESTED PER PARAGRAPH B.I.a AND b IN TABLE I

A. Lot #1412A

Readings:	1.	15,200	
	2.	15,000	Avg. 15,266 Centipoises
	3.	15,600	

B. Lot #1418A

Readings:	1.	19,000	
	2.	19,400	Avg. 19,333 Centipoises
	3.	19,600	

C. Lot #1422A

Readings:	1.	13,200	
	2.	16,400	Avg. 15,200 Centipoises
	3.	16,000	

D. Lot #1433A

Readings:	1.	16,800	
	2.	16,400	Avg. 16,600 Centipoises
	3.	16,600	

E. Lot #1453A

Readings:	1.	20,000	
	2.	21,800	Avg. 21,133 Centipoises
	3.	21,600	

TABLE VI

EXPANSION FACTOR* RESULTS ON THERMOFOAM TYPE I AS TESTED PER PARAGRAPH B.II.a,b,c, AND d IN TABLE I

A. Lot #1412

Vol. of Cured Foam - 8.1 cu.in.

$$\frac{8.1 \text{ cu.in.}}{86.6 \text{ grams}} = .0935 \text{ cu.in./gram}$$

B. Lot #1418

Vol. of Cured Foam - 8.4 cu.in.

$$\frac{8.4 \text{ cu.in.}}{86.6 \text{ grams}} = .0967 \text{ cu.in./gram}$$

C. Lot #1422

Vol. of Cured Foam - 9.3 cu.in.

$$\frac{9.3 \text{ cu.in.}}{87.3 \text{ grams}} = .1065 \text{ cu.in./gram}$$

D. Lot #1433

Vol. of Cured Foam - 8.2 cu.in.

$$\frac{8.2 \text{ cu.in.}}{86.8 \text{ grams}} = .0945 \text{ cu.in./gram}$$

E. Lot #1453

Vol. of Cured Foam - 8.1 cu.in.

$$\frac{8.1 \text{ cu.in.}}{83.3 \text{ grams}} = .0966 \text{ cu.in./gram}$$

*Expansion Factor was called out in the first rough draft of FMS-0076 and was to be determined in this test. Actually the term is misleading since the value obtained is specific volume and not expansion factor. A true expansion factor could be obtained by dividing the foamed volume by the original volume of material before foaming.

TABLE VII

EXPANSION FACTOR* RESULTS ON THERMOFOAM TYPE IA AS TESTED PER PARAGRAPH B.II.a,b,c, AND d IN TABLE I

A. Lot #1412A

Vol. of Cured Foam - 17.9 cu.in.

$$\frac{17.9 \text{ cu.in.}}{86.7 \text{ grams}} = .2064 \text{ cu.ih./gram}$$

B. Lot #1418A

Vol. of Cured Foam - 20.1 cu.in.

$$\frac{20.1 \text{ cu.in.}}{87.3 \text{ grams}} = .2302 \text{ cu.in./gram}$$

C. Lot #1429A

Vol. of Cured Foam - 20.6 cu.in.

$$\frac{20.6 \text{ cu.in.}}{89.6 \text{ grams}} = .2299 \text{ cu.in./gram}$$

D. Lot #1433A

Vol. of Cured Foam - 18.1 cu.in.

$$\frac{18.1 \text{ cu.in.}}{84.6 \text{ grams}} = .2139 \text{ cu.in./gram}$$

E. Lot #1453A

Vol. of Cured Foam - 18.4 cu.in.

$$\frac{18.4 \text{ cu.in.}}{84.6 \text{ grams}} = .2175 \text{ cu.in./gram}$$

*Expansion Factor was called out in the first rough draft of FMS-0076 and was to be determined in this test. Actually the term is misleading since the value obtained is specific volume and not expansion factor. A true expansion factor could be obtained by dividing the foamed volume by the original volume of material before foaming.

TABLE VIII

EXPANSION FACTOR* RESULTS ON THERMOFOAM TYPE II
AS TESTED PER PARAGRAPH B.II.a,b,c, AND d IN TABLE I

A. Lot #3453

Vol. of Cured Foam - 9.14 cu.in.

$$\frac{9.14 \text{ cu.in.}}{95.5 \text{ grams}} = .0957 \text{ cu.in./gram}$$

B. Lot #3457

Vol. of Cured Foam - 7.44 cu.in.

$$\frac{7.44 \text{ cu.in.}}{95.9 \text{ grams}} = .0776 \text{ cu.in./gram}$$

C. Lot #372

Vol. of Cured Foam - 8.49 cu.in.

$$\frac{8.49 \text{ cu.in.}}{96.5 \text{ grams}} = .0880 \text{ cu.in./gram}$$

D. Lot #2479-A3

Vol. of Cured Foam - 8.72 cu.in.

$$\frac{8.72 \text{ cu.in.}}{93.2 \text{ grams}} = .0936 \text{ cu.in./gram}$$

*Expansion Factor was called out in the first rough draft of FMS-0076 and was to be determined in this test. Actually the term is misleading since the value obtained is specific volume and not expansion factor. A true expansion factor could be obtained by dividing the foamed volume by the original volume of material before foaming.

TABLE IX

PERCENT TOTAL SOLIDS RESULTS ON THERMOFOAM TYPE I
AS TESTED PER PARAGRAPH B.III.a,b, AND c IN TABLE I

A. Lot #1412

Sample #1 - 83.7%
Sample #2 - 83.6% Avg. 83.6%
Sample #3 - 83.4%

B. Lot #1418

Sample #1 - 85.3%
Sample #2 - 85.2% Avg. 85.2%
Sample #3 - 85.2%

C. Lot #1422

Sample #1 - 83.7%
Sample #2 - 83.6% Avg. 83.6%
Sample #3 - 83.6%

D. Lot #1433

Sample #1 - 83.7%
Sample #2 - 83.8% Avg. 83.8%
Sample #3 - 83.8%

E. Lot #1453

Sample #1 - 83.4%
Sample #2 - 83.3% Avg. 83.3%
Sample #3 - 83.3%

TABLE X

PERCENT TOTAL SOLIDS RESULTS ON THERMOFOAM TYPE IA
AS TESTED PER PARAGRAPH B.III.a,b, AND c IN TABLE I

A. Lot #1412A*

Sample #1 - 86.9%
Sample #2 - 86.6% Avg. 86.7%
Sample #3 - 86.5%

B. Lot #1418A*

Sample #1 - 87.1%
Sample #2 - 87.1% Avg. 87.3%
Sample #3 - 87.7%

C. Lot #1422A*

Sample #1 - 89.2%
Sample #2 - 89.5% Avg. 89.6%
Sample #3 - 90.0%

D. Lot #1433A

Sample #1 - 84.6%
Sample #2 - 84.6% Avg. 84.6%
Sample #3 - 84.7%

E. Lot #1453A

Sample #1 - 84.6%
Sample #2 - 84.5% Avg. 84.6%
Sample #3 - 84.7%

*Lots 1412A, 1418A and 1422A were cured at 175 ±15°F for 24 hours. This cure time was originally set up for the proposed FMS-0076, but it was found unsatisfactory for removing all the volatiles from the foam. Another cure of 350°F for 2 hours was used and found to be satisfactory; however, there was not enough of the aforementioned lots of Thermofoam to rerun all the total solids. For this reason, some of the total solids as shown in this table appear slightly higher than they actually were.

TABLE XI

PERCENT TOTAL SOLIDS RESULTS ON THERMOFOAM TYPE II AS TESTED PER PARAGRAPH B.III.a,b, AND c IN TABLE I

A. Lot #3453

Sample #1 - 93.1%
Sample #2 - 93.1% Avg. 93.0%
Sample #3 - 92.8%

B. Lot #3457

Sample #1 - 93.2%
Sample #2 - 93.5% Avg. 93.3%
Sample #3 - 93.3%

C. Lot #372

Sample #1 - 94.0%
Sample #2 - 93.8% Avg. 93.9%
Sample #3 - 94.0%

D. Lot #2479-A3

Sample #1 - 93.2%
Sample #2 - 93.2% Avg. 93.2%
Sample #3 - 93.1%

TABLE XII

DENSITY AND COMPRESSIVE STRENGTH OF THERMOFOAM TYPE I*
PREPARED AND TESTED PER PARAGRAPH B.IV.a,c,d, AND e IN TABLE I

LOT NO.	SPEC. NO.	LENGTH (IN.)	WIDTH (IN.)	HEIGHT (IN.)	DENSITY (#/CU.FT.)	AVG. DENSITY (#/CU.FT.)	LOAD TO FAILURE (#)	LOAD TO FAILURE (PSI)	AVG. LOAD TO FAILURE (PSI)
1412	1	1	1	2	50.01		1810	1810	
	2	"	"	"	49.79	50.49	2545	2545	2057
	3	"	"	"	51.68		1815	1815	
1418	1	"	"	"	39.67		1880	1880	
	2	"	"	"	31.76	34.40	1305	1305	1562
	3	"	"	"	31.77		1500	1500	
1422	1	"	"	"	35.66		1140	1140	
	2	"	"	"	34.99	35.55	1265	1265	1215
	3	"	"	"	36.01		1240	1240	
1433	1	"	"	"	30.40		450	450	
	2	"	1.02	1.99	33.45	33.84	625	613	583
	3	"	1	1.99	37.68		685	685	
1453	1	"	"	1.98	33.32		870	870	
	2	"	"	2.00	33.52	32.07	1040	1040	854
	3	.99	.99	1.96	29.38		640	653	

* (TESTED AT 260°F)

TABLE XIII

DENSITY AND COMPRESSIVE STRENGTH OF THERMOFOAM TYPE IA*
PREPARED AND TESTED PER PARAGRAPH B.IV.a,c,d, AND e IN TABLE I

LOT NO.	SPEC. NO.	LENGTH (IN.)	WIDTH (IN.)	HEIGHT (IN.)	DENSITY (#/CU.FT.)	AVG. DENSITY (#/CU.FT.)	LOAD TO FAILURE (#)	LOAD TO FAILURE (PSI)	AVG. LOAD TO FAILURE (PSI)
1412A	1	1	1	2	15.81		925	925	
	2	"	"	"	19.11	17.04	585	585	880
	3	"	"	"	16.19		1130	1130	
1418A	1	"	"	"	25.75		1225	1225	
	2	"	"	"	23.81	25.03	845	845	1097
	3	"	"	"	25.52		1220	1220	
1422A	1	"	"	"	23.33		805	805	
	2	"	"	"	23.77	23.77	755	755	768
	3	"	"	"	24.20		745	745	
1433A	1	"	"	"	29.21		1135	1135	
	2	1.01	1.02	"	32.46	30.62	1600	1553	1319
	3	1	1	"	30.18		1270	1270	
1453A	1	"	"	"	27.90		1230	1230	
	2	"	.98	"	28.01	27.89	1190	1214	1217
	3	.99	1	1.99	27.77		1185	1207	

* (TESTED AT 260°F)

TABLE XIV

DENSITY AND COMPRESSIVE STRENGTH OF THERMOFOAM TYPE II*
PREPARED AND TESTED PER PARAGRAPH B.IV.a,c,d AND e IN TABLE I

LOT NO.	SPEC. NO.	LENGTH (IN.)	WIDTH (IN.)	HEIGHT (IN.)	DENSITY (#/CU.FT.)	AVG. DENSITY (#/CU.FT.)	LOAD TO FAILURE (#)	LOAD TO FAILURE (PSI)	AVG. LOAD TO FAILURE (PSI)
3453	1	1	1	2	20.44		420	420	
	2	"	"	"	21.34	20.31	410	410	378
	3	"	"	"	19.15		305	305	
3457	1	"	"	"	35.39		970	970	
	2	"	"	"	33.02	33.89	700	700	848
	3	"	"	"	33.27		875	875	
372	1	"	"	"	29.94		1025	1025	
	2	"	"	"	29.53	29.05	1015	1015	937
	3	"	"	"	27.68		770	770	
2479-A3	1	"	"	"	28.76		730	730	
	2	"	"	"	34.94	30.51	1090	1090	788
	3	"	"	"	27.83		545	545	

* (TESTED AT 260°F)

TABLE XV

DENSITY AND COMPRESSIVE STRENGTH OF THERMOFOAM PREPARED AND TESTED PER PARAGRAPH B.IV.a,b,c,d AND e IN TABLE I

TESTED AT 260°F

LOT NO. & TYPE	SPEC. NO.	LENGTH (IN.)	WIDTH (IN.)	HEIGHT (IN.)	DENSITY (#/CU.FT.)	AVG. DENSITY (#/CU.FT.)	LOAD TO FAILURE (#)	LOAD TO FAILURE (PSI)	AVG. LOAD TO FAILURE (PSI)
2479-A3 Type II	1	1	1	2	44.04		1485	1485	
	2	"	"	"	44.80		1630	1630	
	3	"	"	"	45.64	44.50	1675	1675	1528
	4	"	"	"	45.90		1450	1450	
	5	"	"	"	42.10		1400	1400	
	6	Specimen broke while being milled							
1412 Type I	1	1	.99	2	38.14		1625	1641	
	2	"	1	2.01	41.86	40.69	2065	2065	2156
	3	"	1.01	2.02	42.08		2790	2762	
1433 Type I	1	1	1	2	37.96		1555	1555	
	2	"	"	"	38.31	39.37	1720	1720	1761
	3	"	"	"	41.83		2010	2010	
1453 Type I	1	1	1	2	34.88		1335	1335	
	2	.98	.96	"	33.72		1080	1149	
	3	"	.99	"	33.81	34.69	1215	1253	1262
	4	1	1	"	36.34		1205	1205	
	5	.99	.99	"	33.99		1290	1316	
	6	"	"	"	35.41		1285	1311	
1453A Type IA	1	.99	1	"	25.31		900	909	
	2	1	"	"	27.13	26.28	1085	1085	1055
	3	"	"	"	26.41		1170	1170	

FIGURE 1

DENSITY VS COMPRESSION STRENGTH OF THERMOFOAM 607
TYPE I (POINTS TAKEN FROM TABLE XII) WHEN TESTED AT 260°F

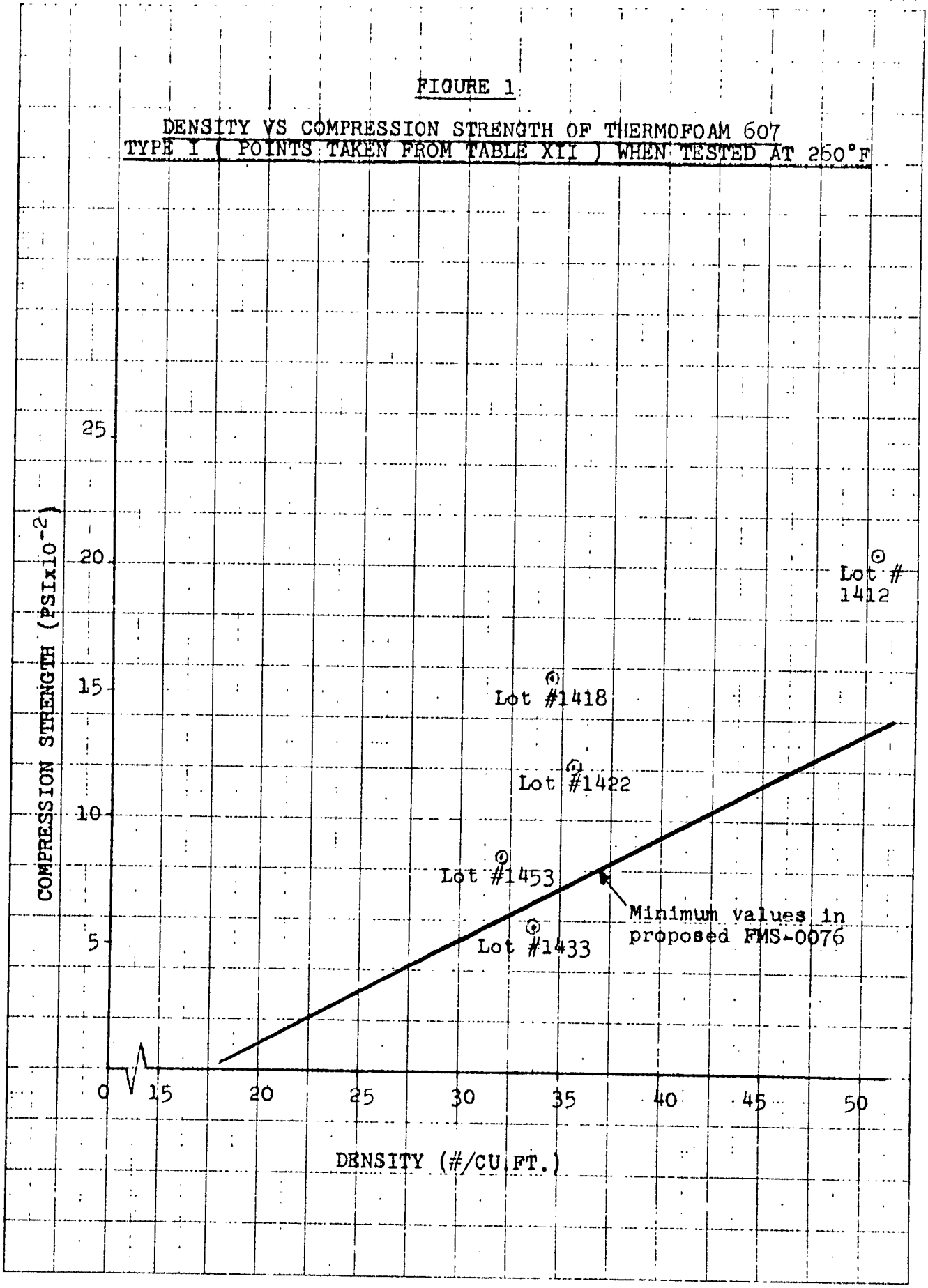

FIGURE 2

DENSITY VS COMPRESSION STRENGTH OF THERMOFOAM 607
TYPE IA (POINTS TAKEN FROM TABLE XIII) WHEN TESTED AT 260°F

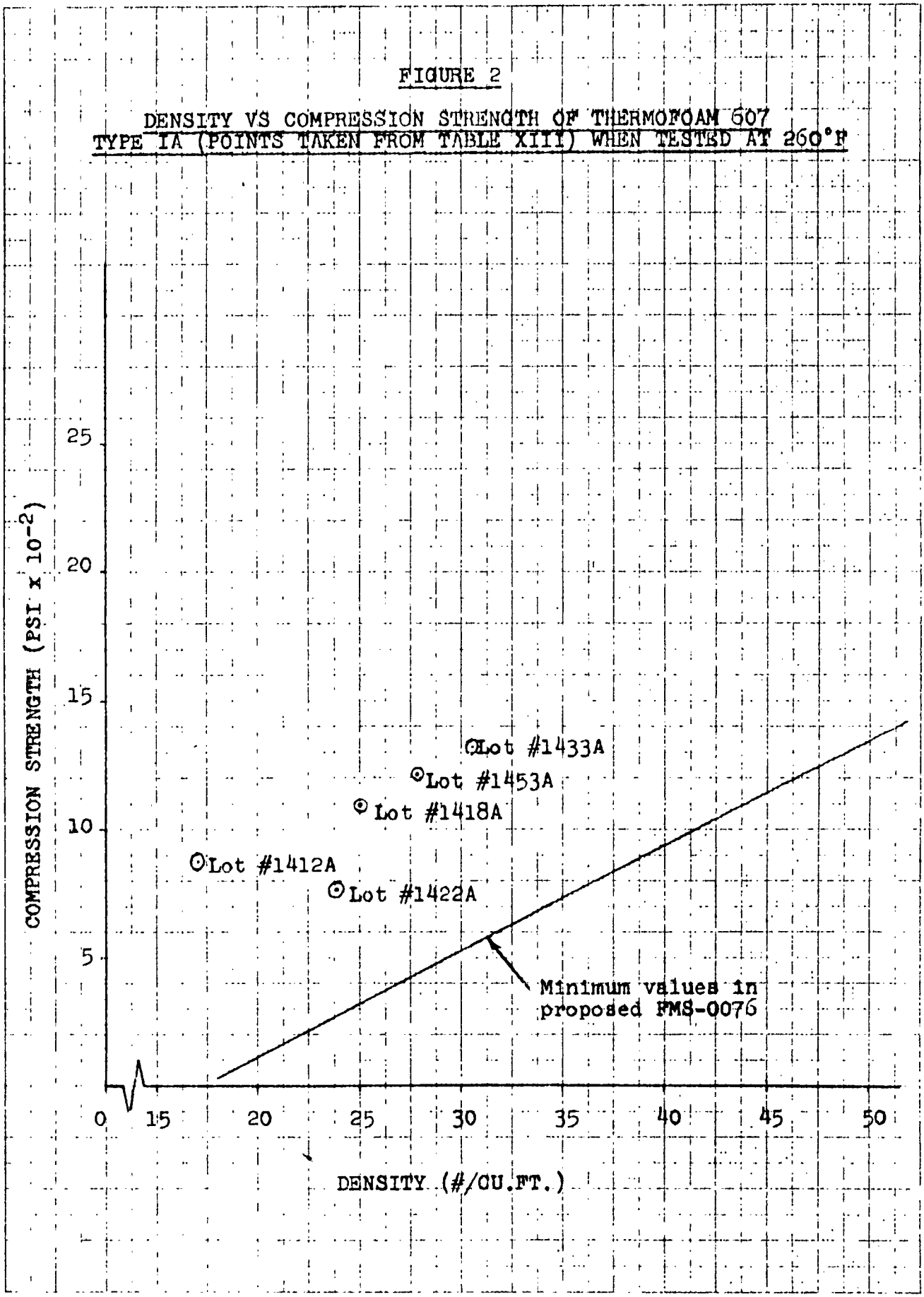

FIGURE 3

DENSITY VS COMPRESSION STRENGTH OF THERMOFOAM 607
TYPE II (POINTS TAKEN FROM TABLE XIV) WHEN TESTED AT 250°F

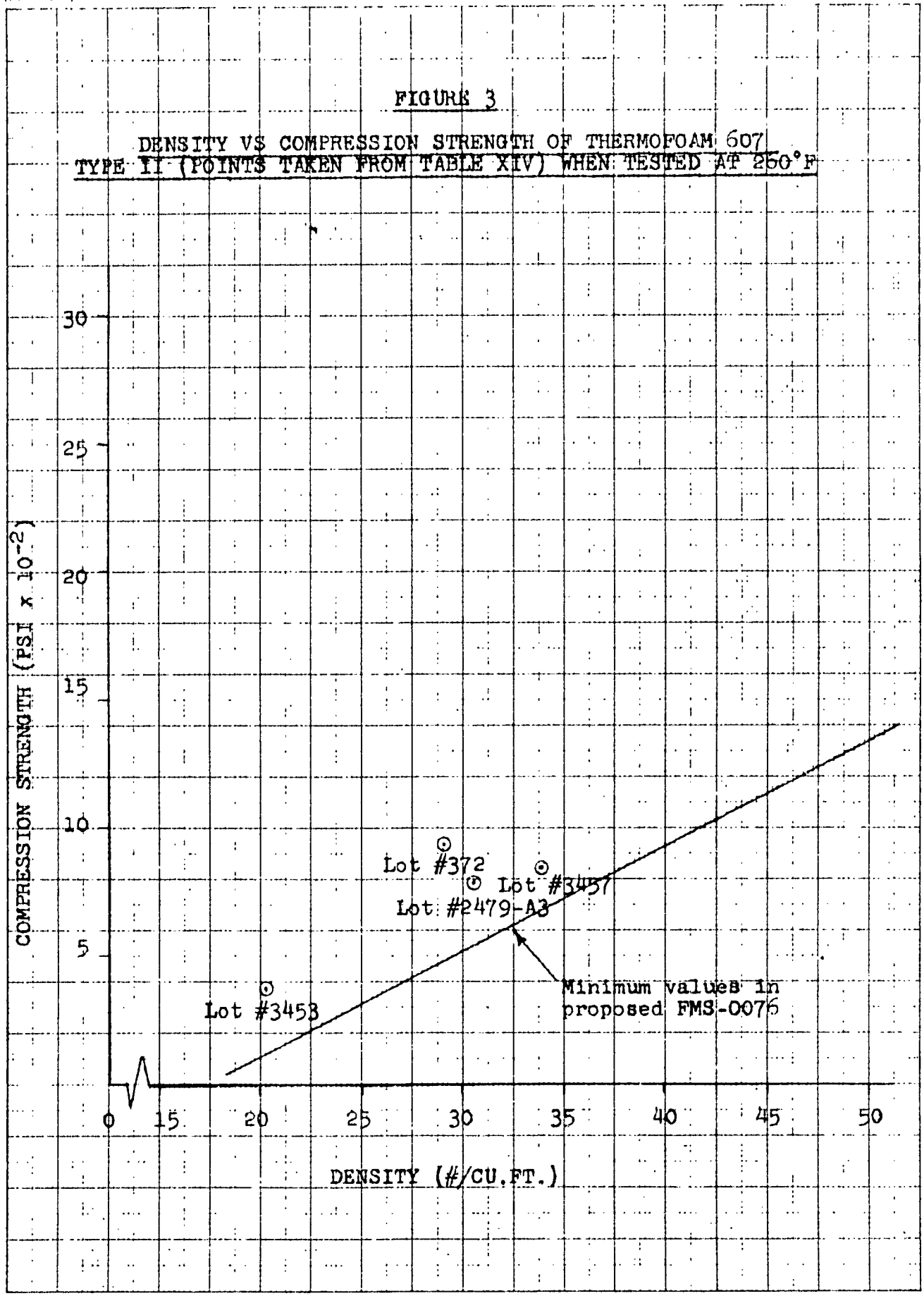

FIGURE 4

DENSITY VS COMPRESSION STRENGTH OF THERMOFOAM 607 TYPES I, IA, AND II WHEN TESTED AT 260°F. (POINTS TAKEN FROM TABLE XV)